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## HENFREY'S BOTANY

*An Elementary Course of Botany, Structural, Physiological, and Systematic.* By Arthur Henfrey, F.R.S. Third Edition by Maxwell T. Masters, M.D., F.R.S., &c. 'Illustrated by 600 woodcuts. (London: Van Voorst, 1878.)

In reviewing a work of this kind, by acknowledged masters of science, the question naturally comes to the front: For what special class of students is it intended? and when this has been settled, a second question: Is the plan which has been adopted the best conceivable for the purpose? The first of these questions appears to be answered in the preface, by the editor's quotation and adoption of Prof. Henfrey's remarks, written in 1857, where he makes special reference to the needs of medical students, who seldom devote to the study of botany more than the summer term of their first session. As to the mode, Dr. Masters also refers with approval to Henfrey's plan of keeping the anatomical and physiological departments of the subject very much in the background, and training the student first of all in morphology and the rudiments of classification; on the ground that by this plan the evil is avoided of "directing the attention of the student to a series of isolated facts and abstract propositions," and of "loading the memory with second-hand information, of no use whatever outside the walls of the examination-room, and indeed of but little service in practical examinations." We may venture to question whether the plan adopted in this work is altogether the best for securing this desirable result, whether, for example, the pages devoted to phyllotaxis<sup>1</sup> do not include a number of "isolated facts and abstract propositions," and whether a longer or shorter description of the characters of considerably over 200 natural orders of flowering plants—when those of twenty-five or thirty are all that would be likely to be of any use to the medical student—may not fairly be open to the charge of "loading the memory with second-hand information;" since it is very few, even of the most experienced botanists, whose personal observation has embraced so wide a range. It is true that this portion may be skipped by the beginner; but then, why include it in a work specially intended for beginners? Fortunately, the day of "Complete Guides to Knowledge" has altogether gone by. The teacher no longer calculates on getting the outlines of every conceivable science within a single pair of boards. This tendency must advance still further, and our text-books must gradually divide themselves into two classes:—one giving primary instruction in the outlines of the entire science; the other, for the more advanced student, entering into the fullest details of special branches. In the science of botany we have numerous admirable text-books and primers which might be included in the first category; in the second, English literature is not yet so rich as French or German. The book before us seems to occupy an

<sup>1</sup> Evidently by an error of the press, the continued fraction of which the most common angles of divergence are successive convergents, is given as  $\frac{1}{2} + \frac{1}{1} + \frac{1}{1}$ , &c., instead of  $\frac{1}{2} + \frac{1}{1 + \frac{1}{1}}$ , &c., a correction needful to render the sentence intelligible to the student.

intermediate position between the two; it is needlessly bulky and expensive for the medical student who looks to nothing but keeping himself abreast of a three-months' course of lectures; it will not suffice for one who aims at becoming a scientific botanist.

After this criticism on the plan of the work—a point on which it is inevitable that different experiences and different modes of looking at the subject will lead to different conclusions—the manner in which the plan is carried out claims all but unqualified approval. In particular is this edition a great advance, in both completeness and accuracy, on that which preceded it; and the editor may be congratulated on having got together a larger amount of trustworthy and accurate information than can be found in any similar work of the same size. Here and there the terminology is hardly abreast of that of the most approved recent writers, as where the term "perisperm" is still used as synonymous with "albumen," to signify any nutritious tissue intermediate in the ripe seed between the testa and the embryo; instead of being confined to the case where this tissue is developed out of that of the nucleus, as in the Nymphaeaceæ, Piperaceæ, and Cannaceæ, in contrast to the much more common "endosperm" which originates primarily within the embryo-sac. But it is remarkable how very few instances there are of defects of this kind, so liable to occur in new editions of old standard works. We notice with satisfaction the tendency to anglicise certain terms, the foreign aspect of which is repulsive to the beginner. Why should not "epiderm" and "parenchyme" become universal, instead of "epidermis" and "parenchyma"?

It is difficult to decide which part of the work is in itself the most satisfactory, that on morphology, on classification, or on physiology, each of these constituting a clear and admirable treatise. The plan advocated in some text-books, of giving the authority of the actual observer for every statement, is not adopted here, and we think wisely. The beginner must take facts which he is not able to verify for himself on the authority of his immediate teacher; it is only when the beginner becomes a student that he has any occasion to trace every statement to its source, or is able to form any judgment on the relative value of different authorities. The advanced text-book of our second category should, therefore, be copious in references; the primer is better without them.

In the department relating to the classification of Cryptogams, Dr. Masters has had the valuable assistance of Mr. George Murray, of the British Museum; and this portion is enriched with a large amount of new and excellent matter. We see, however, here some of the inherent defects of a triple authorship, in the occasional want of harmony of different portions. Thus, while in the general introduction to classification the latest arrangement, that of Sachs's "Lehrbuch," fourth edition,<sup>1</sup> is given, the system actually adopted is substantially that of the second edition of Henfrey's book; Algae and Fungi are still maintained as separate groups, and the former are divided into Characeæ, Rhodospermeæ,

<sup>1</sup> Sachs is, however, erroneously credited with locating Euglenæ under Protophyta. He has never, as far as we are aware, claimed for Euglenæ a position even in the vegetable kingdom.

Fucaceæ, Phæosporeæ, Confervoideæ, and Diatomaceæ—an arrangement which will scarcely bear the light of modern science. The beginner will be likely to be set wrong by finding the term "reproductive organs" sometimes used for the organs between which a sexual process takes place, sometimes for the result of such process; and by reading that Algæ are reproduced by spores which are the result of the action of the antherozoids, while under the head of Fucaceæ the spores are the unfertilised germ-cells, and elsewhere the term appears to be confined to non-sexual reproductive cells which directly reproduce a plant resembling the parent. But these defects do not seriously detract from the value of the work.

Altogether those who want a thorough grounding in the elements of botany, as well as to be taken a little beyond the threshold in the various avenues which open out to the view of the student, will find a very useful and trustworthy guide in the last edition of this old standard.

ALFRED W. BENNETT

#### PAYEN'S INDUSTRIAL CHEMISTRY

*Industrial Chemistry; a Manual for Use in Technical Colleges and Schools and for Manufactures.* Edited by B. H. Paul, Ph.D. (London : Longmans, 1878.)

DR. PAUL has unquestionably rendered some service to the cause of chemical technology in this country by his translation of Payen's well-known work; nevertheless we think the service would have been still greater had he essayed to present us with an entirely original production. The fact is the translation has been made from a translation; it comes to us from the German through Stohmann and Engler's edition. As a consequence we miss much of what is good in Payen, whilst some things that are bad—notably faults in arrangement and inaccuracies of statement—remain. One is reminded of Macaulay's assertion concerning Johnson's Dictionary, which has been so altered by editors that its author would hardly recognise it. Whenever Dr. Paul is on his own ground he is excellent; the supplementary chapters on the chemistry of the metals, for example, are all that could be desired in such a work. The metallurgical portions, more particularly of the more important metals, are especially well done; we question if our language can show anything better on the subjects as regards clearness and conciseness and accuracy than the accounts of the operations involved in the extraction of lead, silver, and iron. But when the editor has to trust to French and German descriptions of technical processes errors crop up. For example, by far the greater portion of the phosphorus which the world requires is made near Birmingham and in Lyons, but neither of the two establishments which thus practically enjoy the monopoly of the manufacture carries out Nicolas and Pelletier's process as described in this work. Britain also furnishes practically all the bichrome of commerce, but the method described on p. 523 is not an accurate description of the present mode of production. The time-honoured cut on p. 181 no longer represents the method by which iodine is manufactured; nor is sulphur obtained by distillation from the traditional pots sacred to the memory of Morgiana and the Forty Thieves, which almost every

compiler of an English text-book has sedulously copied. Saxony produces more than 90 per cent. of the bismuth which is found in commerce, but the liquation process described on p. 505 is no longer in use there. The article on "Friction Matches" is, also, scarcely up to date; the old operation of sulphuration is described in detail as if it were an essential feature in the manufacture; the reader is, indeed, told that the splints are now often dipped in stearin or paraffin, but he would certainly infer from the description that sulphur is generally employed; whereas it is only to meet the demands of lamplighters and sailors who specially need a match less easily extinguished by the wind than the ordinary varieties that a very few establishments continue to use sulphur. The composition of the inflammable paste used in France and Germany may, possibly, be represented by some or all of the eight formulæ given on p. 159, but the "compo" of the English manufacturer is altogether different from these. It is certainly remarkable considering the widespread use of lucifer matches, that so little should be known of their mode of manufacture; it takes quite as many persons to make a match as a pin, and the details of the making are equally interesting.

In the portions treating of pure chemistry inaccuracies are unfortunately scarcely less frequent. We willingly pardon the statement that "hydrogen is an elementary substance known in the free state only as a gas which has not yet been condensed by the greatest cold and pressure combined," even when the book makes its appearance several months after the great triumphs of our continental brethren; but the results of Pebal's work on chlorine peroxide ought certainly by this time to be part of the general stock of chemical knowledge. The statement that bromine solidifies at  $-7^{\circ}3$  is probably based on Pierre's inaccurate observation made more than thirty years since: Baumhauer has shown that the true freezing-point of this liquid is about  $-24^{\circ}5$ . The commendatory statement that "the bromine obtained from Stassfurt has the advantage over all other kinds of commercial bromine, that it is entirely free from iodine" (p. 179), is scarcely just to our own product: the bromine turned out by the Scotch makers actually merits this reputation, whereas there is evidence that the German product, to say the least, has not always deserved it. A distinguished German chemist, in studying the action of bromine on ethylbenzene, was, in fact, led astray by the use of the Stassfurt product, which he assumed to be pure: it was subsequently shown that the bromine used by him contained iodine, and the interesting fact was elicited that the action of this iodised bromine on the hydrocarbon is entirely different from that of the pure substance. The statement of Wollaston that our atmosphere does not extend beyond a height of forty-five miles above the sea-level (p. 54) is scarcely in conformity with current opinion: the observations of Herschel and of Secchi have certainly disproved the assertion as regards this particular limit, whilst the reasoning of Clausius has rendered it highly probable that in reality no limit exists.

A few more errors of commission and omission might be cited, but as it is very far from our desire to disparage a work which, by judicious revision, might fairly claim a very high place in our chemical literature, it is hardly